Forest Research Notes

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EFFECTS OF LOW THINNING IN ATLANTIC WHITE-CEDAR STANDS

Atlantic white-cedar typically grows in dense stands. In southern New Jersey, young stands commonly contain several thousand trees per acre, and at ages around 60 years there still may be 1,000 or more trees per acre.

The great density of white-cedar stands led early foresters to strongly recommend thinning. Akerman (1) thought that thinnings would reduce the time required to grow sawtimber by 20 percent, and would improve the quality as well. Other early foresters were equally sure that benefits would accrue from thinning cedar stands (2, 3, 4, 10).

However, no thinnings actually were made until the 1920's. Mostly these were commercial thinnings in the better stands of about 45 years of age. They yielded net returns of $50 to $100 per acre from the cut products (8, 9).

Income from thinnings, though desirable, should not be the sole determinant of thinning practices. Also of great importance are the effects upon (1) timber production during the whole rotation, and (2) reproduction of the white-cedar after harvest cutting.

Some information about these effects is now available from thinning plots established in the 1920's by the New Jersey Department of Conservation and Economic Development, in well-stocked pure white-cedar stands on 40- to 50-foot sites. Thinnings were made from below, at the following intensities:

Plots (number)	Stand age (years)	Basal area removed (percent)
2	22	21
2	35	34
2	50	37
2	50	35
4	36-40	49

Table 1.--30-year changes after thinning two white-cedar stands

Age of stand (years)	Treatment	Item	White-cedar stems per acre	Average d.b.h.	Basal area per acre	Merchantable volume per acre[2]		Crop trees[1]			
								Average d.b.h.	Basal area per acre	Volume per acre	
			No.	Inches	Sq.ft.	Cords	Bd.ft.	Inches	Sq.ft.	Cords	Bd.ft.
36-40	Thinned[3]	Before thinning	3,558	3.4	223.3	11.5	125	--	--	--	--
		After thinning	1,025	4.5	114.0	10.3	120	5.0	92.2	10.3	120
		30 years later	909	7.0	239.9	54.9	10,510	7.5	206.3	50.0	10,510
		Change	--	+2.5	+125.9	+44.6	+10,390	+2.5	+114.1	+39.7	+10,390
	None	At beginning	3,335	3.5	226.4	12.3	--	5.2	98.0	12.3	--
		30 years later	950	6.6	229.0	51.3	8,130	7.3	192.4	46.6	8,130
		Change	--	+3.1	+ 2.6	+39.0	+8,130	+2.1	+ 94.4	+34.3	+8,130
50	Thinned	Before thinning	2,380	4.4	248.9	24.2	450	--	--	--	--
		After thinning	1,050	5.3	161.8	21.1	450	5.9	125.9	20.1	450
		30 years later	880	7.5	272.8	71.8	16,660	8.1	239.1	66.0	16,660
		Change	--	+2.2	+111.0	+50.7	+16,210	+2.2	+113.2	+45.9	+16,210
	None	At beginning	1,940	4.8	246.9	30.5	1,350	6.4	147.9	25.9	1,350
		30 years later	890	7.7	288.0	77.0	20,240	8.3	253.0	71.0	20,240
		Change	--	+2.9	+ 41.1	+46.5	+18,890	+1.9	+105.1	+45.1	+18,890

[1]The largest-diameter trees, about 670 per acre.

[2]In cords, unpeeled volume to a top diameter (i.b.) of 4 inches, based on table 44 of U. S. Dept. Agr. Tech. Bul. 251 (5). This also includes sawtimber trees. In board-feet, International rule, 1/8-inch kerf, trees 8 inches d.b.h. and larger to a 6-inch top, based on table 40 of Tech. Bul. 251 (5).

[3]Average values from 3 plots after thinning, from 2 plots before thinning.

Each of the four pairs of plots consisted of a thinned plot and a control; the 4-plot set consisted of 3 thinned plots and a control. All plots were small: about 0.04 acre in the 22-year-old stand, and ranging from 0.125 to 0.3 acre in the others.

Because of wildfires and other mishaps, we have only 5-year records for the first three pairs of plots listed above; for the others we have 30-year records.

Results

Mortality, as might be expected, was in most instances much less in thinned than in unthinned plots. In the surviving pair of plots, 30-year mortality was 16 and 54 percent respectively; for thinned plots and control in the 4-plot set it was 11 and 72 percent.

Basal-area growth, with one exception, was substantially greater on thinned plots. However, growth of the larger, "crop" trees was not markedly nor consistently increased by thinning. In terms of basal area and cords, on both 5-year and 30-year plots, the crop trees generally did make slightly better growth where thinning had been done. But in terms of board-feet, where we have 30-year records on stands that now have reached the age of financial maturity--65 to 80 years (5, 7)--growth in one instance was better and in the other was poorer on the thinned plots (table 1).

Although white-cedar is highly subject to windthrow and snow damage, trees on the thinned plots of this study suffered no greater damage from wind and snow than did trees in unthinned stands.

The thinnings had one very adverse effect--they encouraged the development of an understory of shrubs and hardwood trees. These plants are more tolerant of shade than white-cedar (6). During the 30 years since thinning they have formed a very dense understory, with the larger members 6 to 25 feet tall. The species are chiefly sweet pepperbush, high-bush blueberry, dangleberry, red maple, blackgum, and sweetbay. To reproduce white-cedar, this understory must be eliminated or at least controlled. While such control is not so much of a problem now as it was before herbicides were available, still it would require an appreciable investment per acre. From that angle alone, low thinning as done in this study is not desirable.

Discussion

Since the low thinnings described above did not appreciably increase production of merchantable timber, and did have the undesirable effect of stimulating the growth of

hardwood understories, such thinnings are not recommended in white-cedar management.

However, the great density of most white-cedar stands still implies that thinning, if properly carried out, should increase production. The crucial question is: how and when should the thinning be done? Although we have no experimental demonstrations of other types of thinning in white-cedar, observations of many stands, and consideration of the silvics of the different species that are involved, lead us to believe that crown thinnings in reproduction stands would be effective. Such thinnings would be made when the trees were about 10 feet tall, and would be so applied as to favor dominance of about 700 stems per acre. An essential requirement would be that enough smaller cedars be left to serve as trainers and to prevent establishment of objectionable hardwood understories. Any future thinning studies in white-cedar stands should be designed to test this idea.

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--G. T. BAMFORD
Forest Management Section, N. J.
Dept. of Conservation and Economic Development

and S. LITTLE
Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture